

CORRELATION OF LOCALITY NUMBERS FOR VERTEBRATE FOSSIL SITES IN PETRIFIED FOREST NATIONAL PARK, ARIZONA

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Abstract—More than eight decades of vertebrate fossil research at Petrified Forest National Park by various institutions has led to a plethora of locality names and numbers being applied to the same sites. This paper is an attempt to correlate and clarify much of the ambiguity surrounding the vertebrate sites from the park and contains a list of most of the published vertebrate locality names and numbers.

Keywords: Petrified Forest, vertebrate, locality, Arizona, Chinle, UCMP, AMNH, MNA, USNM

INTRODUCTION

Petrified Forest National Park in northeastern Arizona is renowned for its vast deposits of fossilized wood. However it also contains numerous leaf, vertebrate, invertebrate, and trace fossil sites of Late Triassic age. Charles L. Camp documented the first vertebrate localities, 23 in all, from the area that is now Petrified Forest National Park, in his 1930 monograph on the phytosaurs. Sixty-five years later, Long and Murry (1995) published a greatly expanded list of 178 localities, most of which were the result of fieldwork conducted by Long in the 1980s under the auspices of the University of California Museum of Paleontology (see also Long and Padian, 1986; Murry and Long, 1989). In addition to documenting new sites resulting from their fieldwork, Long and Murry (1995) also included older known sites of other institutions, including the American Museum of Natural History (AMNH), the Smithsonian (USNM), and the Museum of Northern Arizona (MNA) as well as Camp's original sites and those of early National Park Service (NPS) naturalists. Consequently, a variety of locality names and numbers have been given to sites in the park by various researchers and, in many cases, to the same localities. As a result of a recent paleontological inventory to relocate and document vertebrate localities in the park, a database correlating various locality designations was created and is reproduced here. It should be noted that Evanoff (1994) created a similar database, however the locality listing presented here was created independently, with only the University of Colorado (UCM) data obtained from Evanoff's work.

Institutional abbreviations: AMNH = American Museum of Natural History, New York; FMNH = Field Museum of Natural History, Chicago; JMP = J. Michael Parrish (University of Colorado, Boulder); MNA = Museum of Northern Arizona, Flagstaff; NPS = National Park Service; PEFO = Petrified Forest National Park; SMU = Southern Methodist University, Dallas; UCM = University of Colorado Museum, Boulder; UCMP = University of California Museum of Paleontology, Berkeley; USNM = United States National Museum (Smithsonian), Washington, D.C.

EARLY LOCALITIES

Charles L. Camp (UCMP)

Camp generally used a four-digit system in the numbering of the early UCMP localities (i.e., 7038, 7040), and occasionally used three digit numbers in conjunction with the prefix A (i.e., A257). The reasons for this are unclear. Even less clear is why Camp later renumbered two of his localities, with V7034C becoming V6667 and V7034D becoming V6559 (Table 1).

National Park Service

Myrl V. Walker, the first permanent naturalist at PEFO, collected many fossil specimens during the 1930s from several different localities using a distinct field numbering system. Vertebrate localities started with the prefix 72- followed by a two-digit number. Plant localities were numbered similarly but with the prefix 73-. Unfortunately, Walker's field numbers are only correlative to a few known sites. Sometime before the Second World War these localities were roughly mapped on a topographic map, most likely by park naturalist Howard Stagner, and given new numbers with a prefix of G. As stated above, no correlations between the old numbering system and the new have been located in the park archives. It should be noted, however, that these "G" series sites were physically marked with wooden posts, some of which can still be located.

The United States National Museum

Charles W. Gilmore was a personal friend of Walker's and, spurred by the discoveries of his friend and of Camp, came to the area accompanied by George Sternberg in 1937 to collect museum quality specimens. Unfortunately Gilmore's sites have not been well documented. However, he appears to have revisited several of Camp's old sites and collected several specimens, principally of phytosaurs (Lucas and Heckert, 2000).

American Museum of Natural History

The AMNH under Edwin H. Colbert conducted paleontological research in the park in 1946. The previous year, Camp had returned to Arizona with Colbert to show him his old localities, and as a result several of the AMNH localities duplicate the earlier UCMP ones. Colbert consecutively numbered his sites with simple two digit numbers.

RECENT LOCALITIES

Museum of Northern Arizona

In 1978-1979, the Museum of Northern Arizona conducted a paleontological inventory of the park, during which 71 new sites were documented (Cifelli et al., 1979). All of these localities are numbered consecutively starting with the number 1 as a subset of the main locality number for the park, which is 302 (i.e., 302:3, 302:78). In addition, all of the previously documented sites including those of the AMNH, NPS, and UCMP were given new numbers using this system.

University of California Museum of Paleontology

Beginning in 1981, the UCMP undertook the most extensive reconnaissance of vertebrate sites in the history of the park. Initiated by Kevin Padian and Robert Long, the UCMP relocated the majority of Camp's old sites in addition to discovering numerous new localities. During the course of this work, Long established various locality numbering schemes including the one in use by the park today; thus, most sites have received at least three separate numbers. Long and Murry (1995) documented many of these numbers and provided some correlation of them in their Appendix I, however more clarification is required.

All of the new sites were given UCMP numbers. What has led to some confusion is the fact that many of Camp's localities are sizable entities and during the course of his work Long broke many of these up into smaller parcels, giving each a new number. Long's new numbers are five digit numbers generally starting with the numeral eight, making them readily distinct from the four digit numbers of Camp. Therefore, many of the UCMP localities possess two or more UCMP locality numbers. In addition, Long provided all documented localities, new and historical, with a PEFO number, a six-digit number beginning with the numerals 085-. These PEFO numbers are used throughout Long's field notes and to label his older photographs, but were never published. Sometime in the late 1980s, each site was consecutively numbered 1-178 with the prefix "PF," with upper unit (Norian) localities possessing low numbers and lower unit (Carnian) possessing higher numbers. This system was used to create the original park locality notebooks and is used extensively in Long and Murry (1995). In the creation of the new park locality notebooks, this numbering system has been retained although the letter "V" was added to the end of the prefix because paleobotanical locality sheets created for the park by S.R. Ash also used "PF." Fossil plant localities are now designated with "PFP."

Field Museum of Natural History

Personnel from the Field Museum collaborated with the UCMP on fieldwork in the early 1980s. Thus, some of the more important quarries such as Crystal Forest Buttes and Dinosaur Hill have FMNH field numbers in addition to those of UCMP and PEFO. In fact, the Dinosaur Hill quarry has also been called the Bolt Quarry after Dr. John Bolt of the FMNH.

University of Colorado

Researchers from the University of Colorado, including J. Michael Parrish and Steven C. Good, conducted independent research in the park during the 1980s as well as assisting the UCMP parties. Thus, as with the FMNH, several productive localities also possess UMC numbers. In addition, several sites are still designated by Parrish's (JMP) field numbers.

Southern Methodist University

Phillip Murry conducted a microvertebrate study in PEFO in 1988 and 1989. Murry revisited and sampled many known localities in search of fossils and gave the preexisting localities new SMU numbers, including the site Murry erroneously thought was Dinosaur Hill (Murry, 1989; Murry and Long, 1989; Long and Murry, 1995).

PROBLEMATIC LOCALITIES

Dinosaur Hill

The Dinosaur Hill site (PFV40) occurs in a series of low mudstone hills and ridges along the southern park boundary of the Painted Desert area just north of Interstate 40. The site was

discovered by archaeologist Ann Preston in 1982 and collected by workers from the UCMP, UCM, and FMNH between 1981 and 1985. The site has remained productive and in recent years has been collected by staff from the Mesalands Dinosaur Museum (Tucumcari, New Mexico) and PEFO. Material from this locality has been published in several papers (Padian, 1986, 1990; Parrish, 1991) under the UCMP locality number V82250. Parrish (1991) called the site the Lacey Point Quarry, while Padian (1986, 1990) simply referred to it using the UCMP locality number. In the UCMP locality file V82250 is called "Inadvertent Hills," this usage is repeated in Long and Ballew (1985) but has since fallen out of favor. Another name for the locality is the "Bolt Quarry," and originally the nearby sites of Billingsley (Snail) Hill were once considered part of V82250. Sometime during the 1980s the site was given the name Dinosaur Hill, presumably because of the partial coelophysoid skeleton collected there (Padian, 1986). This is the name that is currently and most commonly used and thus should be used to refer to this locality (Murry and Long, 1989; Long and Murry, 1995; Hunt et al., 1998; Hunt and Wright, 1999; Therrien and Fastovsky, 2000; Heckert, 2001; *contra* Angielczyk, this volume). It is extremely important to note, as stated in Long and Murry (1995), that the "Dinosaur Hill" micro-site of Murry and Long (1989) is not the same locality as PFV40. Instead it is site PFV27 (Lacey Point SW1), which is approximately 0.7 km to the NW of Dinosaur Hill proper, although it is at a similar stratigraphic level.

Dying Grounds

The name "Dying Grounds" has been widely used for a portion of the Blue Forest area, however its exact location is highly ambiguous, with two general areas being given the name independently. These areas are in close proximity but unfortunately represent fairly distinct stratigraphic positions. The first is due west of Blue Mesa in an area that Camp (1930) called "Phytosaur Basin" (PFV 121, "Phytosaur Basin E" in Long and Murry, 1995). Large amounts of scattered bone occur in a grayish purple bentonitic mudstone (unit 15 of Lucas' [1993] Blue Mesa Member type section) over approximately 160,000 square meters of exposed outcrop.

The second area is a small depression approximately 0.7 km NNE of "Phytosaur Basin." This area was informally called "Amphibian Basin" by Camp and is a few hundred meters due south of his Crocodile Hill locality (PFV124). Again, large amounts of bone are scattered throughout this locality mainly in a greenish gray mudstone (unit 14 of Lucas' [1993] Blue Mesa Member type section) and also within the overlying purple-gray mudstone, which is equivalent to the bone-producing horizon in Phytosaur Basin E. This area is designated as PFV122.

Both areas described above are physically contiguous spatially, partially overlap stratigraphically and contain copious amounts of vertebrate material, thus the combined areas could and have been informally named the "Dying Grounds." However, the second area represents what has been termed the Dying Grounds by Murry (1989), Murry and Long (1989), Long and Murry (1995), and Heckert (2001) and should be considered the official Dying Grounds locality. Therefore, the proper number for the Dying Grounds locality is PFV122 *contra* Long and Murry (1995), who list the "Dying Grounds" as PFV121. This is a typographical error that has caused much confusion (see Heckert, 2001). Close examination of the locality list in Long and Murry (1995) reveals that PFV121 was listed twice for distinct localities. In addition Long's unpublished field notes and photographs on file at PEFO refer to PFV 122 as the "Dying Grounds."

It should also be noted that PFV122 is in close proximity to the "Dinosaur Wash" site described by Hunt et al. (1996) and Hunt

and Wright (1999). As a result, Therrien and Fastovsky (2000) basically synonymized the two, and this assignment is followed here. Additionally, it should also be pointed out that PFV122 had also originally been given the name Camp Butte N1 by Long.

CONCLUSION

The nomenclature and numbering systems for vertebrate localities within Petrified Forest Park has been unstable and ambiguous for years. The PF system first documented by Long and Murry (1995) is currently in use within the park today and has been followed by other workers (i.e., Heckert, 2001). Therefore, future references regarding vertebrate localities in the park should use the prefix PFV followed by the site numerical designation as

listed in Table 1 and in Long and Murry (1995). Dinosaur Hill is the proper name for PFV40, and the name "Dying Grounds" should be restricted to site PFV122, which also includes Dinosaur Wash. A working locality database has been established for the park. It is hoped that future workers will utilize and add to this database to avoid future site ambiguity and to encourage stability of a single numbering system.

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TABLE 1. Correlation of locality numbers from diverse research institutions with a listing of all names given to the various localities in Petrified Forest National Park (data from Camp, 1930; Long and Ballew, 1985; Murry and Long, 1989; Evanoff, 1994; Long and Murry, 1995; and unpublished data)

PFV #	PEFO #	UCMP #	MNA #	Other numbers	Locality Name(s)
1	085085	V6667	302:108		Adamana 3 (Also numbered UCMP V7034C)
2	085086	V82241			Black Forest
3	085087	V82247			Zuni Well N2
4	085088	V82255			Zuni Well N1
5	085089	V82266			Zuni Well N3
6	085084	V6559	302:107		(Also numbered UCMP V7034D)
7	085090	V82253			Kachina Point NE1
8	085091	V82274			Kachina Point NE2
9	085092	V84234			Tawa Point NE1
10	085093	V84235			Tawa Point NE2
11	085094	V7034E	302:109		Adamana 4
12	085095	V85241			Tawa Point E
13	085174	V85246			Tawa Point N
14	085096		302:34		Kachina Point NE3
15	085175	V85243			Tiponi Butte N
16	085097	V84236			Chinde Point N1
17	085098	V84237			Chinde Point <i>Schilderia</i> Field
18	085099	V84255			Chinde Point N2; Dinosaur Hollow E
19	085100	V84256			Chinde Point N3
20	085101	V84260			Dinosaur Hollow
21	085183	85 H5-31-1			Pintado Point NW1 (J. Howard Hutchinson (UCMP) site)
22	085184	85 H6-5-1			Pintado Point NW2 (J. Howard Hutchinson (UCMP) site)
23	085175	V85242			Dinosaur Hollow W
24	085103	V84249			Tiponi Point
25	085104	V82267			Rim Tank North
26	085105	V84222			Wildhorse Wash
27	085106	V82242		SMU 229	Lacey Point SW1; Mesa Mound; "Dinosaur Hill" (see text)
28	085107	V82256			Lacey Point SW2
29	085108	V82275			Lacey Point SW3
30	085109	V84238			Zuni Well Road 1
31	085110	V84239			Zuni Well Road 2
32	085111	V84240			Zuni Well Road 3
33	085112	V84241			Zuni Well Road 4
34			302:26		Dinosaur Hill NE1
35			302:27		Dinosaur Hill NE2
36			302:30		Boot Ridge SE
37	085116	V82272			Hell Wash
38	085117	V85226			Three Witches
39	085118	V85227			Three Witches E
40	085119	V82250		FMNH 83-3	Dinosaur Hill; Inadvertent Hills: Bolt Quarry; Lacey Point Quarry (see text)
40	085177	V85244			Dinosaur Hill; Inadvertent Hills: Bolt Quarry; Lacey Point Quarry (see text)
41	085120	V84227			Dinosaur Hill NW1
42	085181			UCM (JMP 85-5)	Petroglyph phytosaur site
43	085122		302:28		Dinosaur Hill W
44	085123		302:31		Petroglyph Mesa E1
45	085124		302:41		Petroglyph Mesa E2
47	085189				Boot Ridge NE; Lacey Point NW
48	085125	V82268			Dead Wash 1
49	085126	V82269			Dead Wash 2
50	085127	V84223			Dead Wash <i>Schilderia</i> field
51	085128	V84229			Paulcell 2
52	085129	V84230			Paulcell 3
53	085130		302:85	AMNH 26, 27, 28, 29	AMNH Billings Gap
54	085131			USNM 13	USNM Billings Gap
55	085132	V82040			Dry Creek Tank SE1
56	085133	V84225			Paulcell shellbed
57	085134	V7043	302:96		Adamana 12; UCMP Billings Gap
58	085135	A256	302:99		Limestone Reef
59	085136		302:84	NPS G27	Ramsey Slide Tank
60	085137	V84246		FMNH 83-6	Gatesy's Plunge
61	085138		302:18		Mountain Lion Mesa 1
62	085139		302:19		Mountain Lion Mesa 2
63	085140		302:20		Mountain Lion Mesa 3
64	085141		302:21		Mountain Lion Mesa 4

TABLE 1. (continued)

PFV #	PEFO #	UCMP #	MNA #	Other numbers	Locality Name(s)
65	085142		302:22		Mountain Lion Mesa 5
66	085171	V82265			Battleship West 3
67	085172	V84247			Battleship SW
68	085143	V84250			Martha's Butte SE
69	085144	V82263			Petrified Forest Tank E
70	085145	V82258	302:44		Flattops NW
71	085146	V82259			Flattops W
73	085149		302:59		Flattops N2
74	085150		302:45		Flattops N3
75	085152	V82240			Flattops E; Karen's Point
75	085153	V82246			Flattops E; Karen's Point
75	085156		302:55		Flattops E; Karen's Point
75	085157		302:60		Flattops E; Karen's Point
75	085158			NPS G13	Flattops E; Karen's Point
77	085154	V84251			Karen's Point NW
78	085147	V82270			Flattops N
79	085155		302:54		Flattops NW
83	085159	V84244		USNM ?	Jim Camp Wash 2
84	085160	V84252			Jim Camp Wash 3
85	085161	V84253			Jim Camp Wash 4
86	085162	V84254			Jim Camp Wash 5
87	085163	V84220			Bat Cave
88	085164	V84221			Jim Camp Wash 1
89	085165	V84224	302:23		Bowman Locality
90	085166	V84242			Giant Logs N2
91	085167	V84243			Pet. Forest Tank SE
92	085173	V84259			Little Battleship W; UCM 86209
93	085168	V84258			Little Battleship E
94	085169	V82271			Giant Logs N1
95	085170	V84248			Old One-Eighty E
96		V7034			Devil's Playground
97	085002	V82251		AMNH 24	Saurian Valley; part of UCMP V7034
98	085003	V82252	302:105		Fossil Garden; part of UCMP V7034
99	085004	V85225			Saurian Valley N1; part of UCMP V7034
100	085005	V85228			Wizard Wash E
101	085006	V85229			Devil's Cauldron E
102	085007		302:40		Devils Cauldron (in part)
103	085008	V7034	302:92		Fossil Garden W
104	085009		302:81	NPS G16	Walker Locality
105		V82254	302:40		Devil's Cauldron
106	085010	V3923			Depot Tank NW
107	085011	V7036	302:103		Depot Tank SW
108	085012	A258	302:104		Depot Tank S; Brown Pool
109	085013	A267			Little Carrizo Wash
110	085014		302:89		Depot Tank E
111	085015	V82273			Teepees NW1
112	085192	V82273			Teepees NW2
113	085061	V82244			Blue Mesa NW
115	085018	V82233			Blue Mesa N1
116	085019	V82236			Blue Mesa N2
117	085020	V82248			Teepees NE
118	085021	V82257			Teepees E1
119	085022	V82276			Phytosaur Basin W
120	085023	V7039	302:101		Phytosaur Basin; Adamana 8
121	085024	V7040	302:101		Phytosaur Basin E; Adamana 9; "Dying Grounds" (see text)
122	085025	V7038	302:8	SMU 228	Camp Butte N1; Dinosaur Wash, Dying Grounds (see text)
123	085026	V85235	302:115		Annie's Canyon (part of V7038)
124	085027	V85236	302:74;	AMNH 116; USNM 25	Crocodile Hill (part of V7038) (also NPS G8; SMU 230)
125	085028	V85237			Olsen's Site
126	085029	V85238			Gastellum site; Camp Butte E
127		V85231			Hutchinson micro site; Camp Butte N2
128	085030		302:3		Teepees East 2
129	085031		302:4		Teepees East 3
130	085032		302:5		Teepees East 4
131	085033		302:6		Teepees East 5
132	085034		302:7		Teepees East 6

TABLE 1 — (continued)

PFV #	PEFO #	UCMP #	MNA #	Other numbers	Locality Name(s)
133	085035		302:8		Teepees East 7
134	085036		302:9		Teepees East 8
135	085037		302:10		Teepees East 9
136	085038		302:61		Teepees East 10
139	085039		302:74		Teepees East 11
140	085041				Blue Forest N
141	085041	V7040	302:90	AMNH 30	Phytosaur Basin NE
142	085042	V7041	302:100		Blue Mesa E; Adamana 10; Pictograph Tank
143	085043	V82235	302:73		Blue Mesa NE2; Fence line
144	085044	V82234			Blue Mesa NE1
145	085045	V84233			Paulcell 6
146	085046	V7042			Lower Billings Gap; Adamana 11
147	085047	V84228			Paulcell 1
148	085048	V84232			Paulcell 5
149	085049	V84226			Angry Man Flat
150	085050	V84231			Paulcell 4
152	085058	V7047	302:98		Twin Buttes 1
153	085056	V7043	302:96		Dry Creek Tank, "Billings Gap" of Camp
154	085057	A257	302:95		Cowboy; Smithson Skull Locality
155	085058	V7047	302:98		Twin Buttes 2
156	085059	V7046A			Point of Bluff S
157	085060	V7046	302:97	USNM 97	Point of Bluff N (also UCMP loc. A268)
158	085061		302:50		Point of Bluff E
159	085062	V82243	302:11		Agate Bridge NE
159	085063	V82243	302:12		Agate Bridge NE
160	085064		302:13		King's Throne
161	085065	V7044	302:94		First Forest (Jasper Forest)
161	085065	V82239	302:53		Agate Bridge N
162	085066	V82249			Agate Bridge NW
164			302:14		King's Throne SE
165	085068	V82245			Agate Bridge SE
166	085069	V82237			Jasper Forest W
167	085070	V82041	302:42	SMU 232	Jasper Forest S
167	085071	V82041	302:43		Jasper Forest S
169	085075	V82261			Battleship NW
170	085073	V82264			Battleship W2
171	085074	V82260			Battleship W1
172	085076	V7037	302:93		Second Forest (Crystal Forest)
172	085077	V82238			Crystal Forest; part of UCMP V7037
173		V85240		FMNH 83-8; SMU 89013	Crystal Forest Buttes; part of UCMP V7037
174	085078		302:56		Crystal Forest S1
175	085079		302:57		Crystal Forest S2
176	085080		302:58		Crystal Forest S3
177	085081	V82232			Giant Logs
178	085082	V3926			Third Forest (Rainbow Forest)
179	085083	V82042			Long Logs; Sonsela Sandstone